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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/698,884
Filing Date: October 31, 2003
Appellant(s): HAIGHT ET AL.

Jeffrey M. Glunta
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 3/31/2006 appealing from the Office action mailed 3/29/2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal & appellants indicate there are none.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

GROUNDS OF REJECTION NOT ON REVIEW

The following grounds of rejection have not been withdrawn by the examiner, but they are not under review on appeal because they have not been presented for review in the appellant's brief. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polanyi et al (6,319,566), optionally in view of Morishige (4,711,790) as applied to claims 1-6, 8-14 and 20-22, and further in view of Baum et al (5,407,710), optionally further considering Baum et al (206).

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

6,319,566	Polanyi et al	11-2001

4,711,790	Morishige	12-1987
Trushin et al	"Femtosecond Dynamics and Vibrational Coherence in Gas-Phase Ultraviolet Photodecomposition of $Cr(CO)_6$"	1998 (no month)

Additionally for claim 7 not presented for review, the following patents were relied upon

5,407,710	Baum et al	4-1995
5,686,206	Baum et al	11-1997

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6, 8-14 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polanyi et al (6,319,566), alone or in view of Morishige (4,711,790).

In the claims, it was noted that while claim 1 requires photochemical decomposition within the deposited film, it does not exclude other mechanisms from also taking place, such as thermal decomposition concurrently occurring. Also note that for the claims as written, while formation of the film may occur simultaneously with the irradiation, the claim language does not necessitate that the irradiation must occur while the carrier gas with suspended donor compound is passing over the substrate, i.e. during forming of the film. The scope of "a donor compound suspended in a carrier gas" is

considered to include any state of compound, i.e. gaseous, liquid, or particulate, that is entrained in or carried by the carrier gas.

Polanyi et al teach molecular or atomic patterning of adsorbates on the substrate surface that may be photo induced (lasers, such as 193 nm) reaction of the adsorbates on a femtosecond time scale (col. 13, line 26), and their technique may employ a large number of gases, such as metal organic compounds inclusive of $Mo(CO)_6$, which absorb on the surface and such organometallics deposit metal or the like in patterns due to the irradiation. See the abstract; col. 4, lines 32-53; col. 7, lines 1-15 and 52-62; col. 9, lines 12-22; col. 13, lines 20-col. 14, lines 40+; col. 15, lines 1-45 & 65-col. 16, line 51 ($Mo(CO)_6$). Polanyi et al's adsorbate may come from gaseous compounds, and forms a film before any irradiation takes place on the absorbed monolayer, where photodissociation is taught to occur in the adsorbate in a localized manner during irradiation. This sequence explicitly excludes photolytic decomposition of gaseous precursors occurring, hence the irradiations intensity is necessarily insufficient to cause photolytic break down of suspended or gaseous precursor. It was further noted that Polanyi et al. stated on col. 10, lines 28-32 that "...all experiments were performed under UHV, so gas-phase dissociation by the irradiation was negligible...not limited to UHV, but can be utilized wherever ordered adsorbates are in contact with substrates". No thermal decomposition is disclosed; hence there is no expectation that such is involved in the photodissociation process.

Polanyi et al differ by not discussing whether or not their gases may include carrier gases, but since use of carrier gas is a standard procedure depending on the vapor characteristics of the precursor materials involved, and the conditions under which they are gaseous, it would have been obvious to one of ordinary skill in the art to use such conventional techniques depending on the precursor employed and its vaporization characteristics and transport properties, noting that vaporization of either liquid or solid starting materials, especially compounds thereof, standardly employ carrier gases in their delivery systems, such that use of such typical procedures would have been considered by one of ordinary skill in

the art for the delivery of gaseous materials in Polanyi et al. While the primary reference does not illustrate or discuss particular delivery configurations or parameters (rate, laminar flow, etc.), Polanyi et al. are depositing on the surface with gaseous material, hence that gaseous material must necessarily be delivered "over" the surface on which it is deposited, and since they teach as noted above deposition of an ordered monolayer absorbed on the surface from gaseous exposure, those exposure conditions, including the rate of supply are clearly effective for monolayer formation. Standard technique for gas phase depositions is for the gas to be flowed to the substrate, such that it would have been the expectation of one of ordinary skill of the art reading Polanyi et al. for gaseous material supplied to the substrate with or without carrier gas to be flowing over that substrate, unless clearly otherwise stated. Laminar flow (streamline flow in a fluid near a solid boundary) is also a standardly employed delivery technique, such that given the taught ordered monolayer absorption of precursor material one of ordinary skill would have expected to have been produced by an ordered flow, such as laminar flow, because it would have been expected to be more difficult to produce a monolayer with turbulent flow, which would not necessarily have uniform or even delivery. Employment of standard gaseous delivery techniques, with or without carrier gas, is not considered to provide patentable significance to the claim process, especially considering analogous monolayer molecular depositions.

Alternately, Polanyi et al teach the metal carbonyl, $Mo(CO)_6$ in col. 16, and Morishige shows that such gases as ($Cr(CO)_6$ are used with carrier gas (col. 7, lines 33-42) or molybdenum hexacarbonyl vapor in argon (col. 8, lines 52-68), where gas systems for delivery of such gaseous mixtures to systems being treated by a pulsed laser beam, are taught to flow through the reaction cell at desired flow rates as known in the art (col. 5, lines 4-9+) and illustrated in figure 1 in a direction, which would be consistent with laminar flow and consistent with configurations that would have been expected to be effective in the primary reference to allow precursor delivery to the surface during irradiation, hence it would have been obvious to one of ordinary skill to employ such procedures with the generally suggested precursor

materials of Polanyi et al, because of their demonstrated effectiveness with overlapping and analogous gases intended for substrate deposition in systems that are irradiated with a laser.

A Note in col. 9, lines 33-50 & 14- 23 of Polanyi et al., while 193 nm excimer lasers are suggested, use of visible light as an alternative is also taught, so one of ordinary skill in the art would have expected the wavelength to be chosen according to material treated, which is not specified for any of the particular wavelengths claimed, so had no specific effect for the claims as written.

Claims 23-24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Polanyi et al, optionally in view of Morishige as applied to claims 1-6, 8-14 and 20-22 above, and further in view of Trushin et al ("Femtosecond Dynamics...").

While Polanyi et al teach the irradiation process is a femtoscale process in some of their exemplary processes (col. 13, line 26), they do not ever actually disclose what pulse width their lasers employ when dealing with the femtoscale process, but they do note in general that the time scale on which patterning/imprinting of the adsorbate takes place is determined by the irradiation time, noting usefulness of lasers having pulse widths from nanoseconds to picoseconds as exemplary in this general discussion (col. 4, lines 39-50, especially 43-48).

Trushin et al discloses the femtosec dynamics of the metal carbonyl $Cr(CO)_6$ from UV decomposition, with the introduction relating to metal carbonyls (Cr, Mo, W) in general. The experimental section on page 4310 shows the use of 130 fsec or UV laser (267 nm) pulses to cause the carbonyls' dissociation, but this research paper does not discuss the use of these dissociated metal organic precursors for any particular purpose or end use, besides basic research. However, it would have been obvious to one of ordinary skill in the art, that as Polanyi et al's pulsed laser deposition process may be on a fsec time scale, and may include localized photodecomposition techniques used on $Mo(CO)_6$, and that Trushin et al shows pulsed lasers dissociating carbonyls as taught by Polanyi et al on the taught time scale

by using 130 fsec pulses, that such pulse duration would have been expected to be effective in the deposition process of Polanyi et al, as they are consistent and complementary with the teachings therein, show claimed femtosecond durations to be applicable to specific compounds discussed in the primary reference, are supplying a needed parameter that is not directly discussed for those specific reactions, but is suggested by the taught fsec time scale with the demonstration that such metal carbonyls photo decompose on that time scale, and Polanyi et al.'s acknowledgment that time scale of the process is determined by the irradiation time.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Polanyi et al, optionally in view of Morishige as applied to claims 1-6, 8-14 and 20-22 above, and further in view of Baum et al (5,407,710), optionally further considering Baum et al (206).

Polanyi et al does not specify dimethyl gold trifluoro acetylacetonate as a deposition material, but the deposition materials cited therein are taught only as an examples, and the process is taught not to be limited thereto (col. 15, lines 65- col. 6, line 51), including organometallics generally, thus it would have been obvious to one of ordinary skill in the art to use other known metal deposition gases other than the suggested example, as illustrated by Baum et al ((710): abstract; col. 2, lines 43-col. 3, lines 47 & examples 1-2, and col. 4-5) who shows the equivalent use of $Mo(CO)_6$ suggested in Polanyi et al with the claimed gold compound, i.e. Baum et al (710) shows that the claimed dimethyl Au trifluoroacetylacetonate can be equivalently used for photo-deposition with metal carbonyls ($Mo(CO)_6$), hence one of ordinary skill in the art would have been motivated to employ alternative precursors as taught in Baum (710) in the primary reference techniques with expectation of success.

Baum et al ((206); abstract; col. 3, lines 33-59; example 1, col. 4) is of interest for providing further motivation or expectation/evidence of effectiveness by teaching overlapping laser and/or wavelengths used with the process of Baum et al (710).

(10) Response to Argument

It is noted at the beginning of their argument section, in the only full paragraph on page 6 of the brief appellants repeat verbatim most the limitations of claims 1, 9, 10, 15, 16 & 20, however neither of claims 15 or 16 are rejected, thus the statements that the references do not teach the limitations of claims 15 and 16 are irrelevant.

The examiner notes that at the bottom of page 6 in the brief, appellants take claim 1 as representative of the claims rejected over Polanyi et al, optionally in view of Morishige, except for claims 9, 10 & 20. In the first full paragraph on page 7, appellants note Polanyi et al.'s emphasis on patterning, however whether or not patterning is present is irrelevant to the claims as written, especially as Polanyi et al. explicitly disclose absorption of an ordered monolayer from gas in their summary in col. 3. In the next two paragraphs on page 7, appellants discuss the teaching in col. 10 of Polanyi et al. concerning negligible gas phase dissociation by irradiation, where their conclusion that it only occurs under ultrahigh vacuum ignores the part of the teaching stating that the process is not limited to UHV, but can be utilized where ever ordered adsorbates are in contact with substrates. Furthermore, as appellants' claims do NOT exclude processing under UHV, as the claims are silent as to whether or not vacuum of any sort is used, so this is not even relevant. It is also noted that their conclusion that use of a UHV environment excludes the presence of a carrier gas with a donor suspended in it, is unsupported and unwarranted, since the degree of vacuum one produces for processing does not in any way limit what precursors or carriers therefore one inputs into the vacuum. The first paragraph on page 8 of the brief has similar irrelevant comments concerning gas evacuation and alternative irradiation techniques in Polanyi et al.

Appellants' second paragraph on page 8, is reading more into claim 1 than is actually necessitated by the claim language. While claim 1 is inclusive of performing the film deposition from the carrier gas while irradiating, the claim language does not actually necessitate that the irradiation must occur while the gas is being passed over the substrate, as there is no positive limitation requiring such a feature. That the

intensity of the optical radiation must be insufficient to cause significant photolytic breakdown of molecules of the donor per compound suspended in the carrier gas, does not mean that the optical radiation must pass through that carrier gas. Furthermore, the much discussed lines 28-33 of col. 10 in Polanyi et al., would appear to indicate that the irradiation is occurring or can occur during the deposition of the adsorbate film. Again appellants' comments concerning "...a significant gaseous atmosphere of any composition..." is drawing unfound conclusions, since whether or not one uses a carrier gas has more to do with the vaporization and flow characteristics of your precursor material, and is not determined by the pump down pressure used in the reaction chamber, especially noting the appealed claims have not even limited what pressures under which the process may be performed.

With respect to arguments on page 9, in the rejection the examiner clearly stated that Polanyi et al. did not teach or explicitly discuss a carrier gas, but gave reasons why such was obvious and appellants' arguments have not given any convincing reasons why such would not be the case. Furthermore, if one notes Polanyi et al.'s generic teachings in the sentence bridging col.s 15-16, that states a large number of gases have been used for radiation induced writing and doping, inclusive of metal organic compounds, where it is noted that such are well-known to those skilled in the chemical vapor deposition art (which were shown by the optional secondary reference to Morishige to be inclusive of use of carrier gases), thus implying that such CVD process techniques are suggested for use in forming adsorbate layers of Polanyi et al., one cannot reasonably support a conclusion that carrier gases are excluded from being effective. Further note what appellants require, is that there is no photolytic breakdown in the molecules of the donor compound, however appellants have given no convincing reason why the presence or absence of carrier gas will have any effect on whether or not the molecules of the donor compound do or don't undergo photolytic breakdown, especially given that the claimed reason is the intensity of the radiation, and there is no reason to expect that the carrier gas would in itself cause such a breakdown, unless one carelessly selected a radiation wavelength absorbed by the carrier gas.

Appellants' discussion of Morishige on pages 10-11 of the brief is not directed towards reasons for which the secondary reference was optionally combined with the primary reference, but discuss this reference as if it was the primary reference, which it is not. Furthermore, appellants' statement that "Morishige does not describe any gas flow over the substrate as part of its process" indicates that they have ignored what the reference actually teaches as illustrated very clearly in figure 1, which is on the cover of the patent. One should further note that as Morishige is in putting gas (by passing it over the substrate) at the same time it is irradiating, and that Polanyi et al. may also deposit their film simultaneously with irradiation, but provides no description or illustration of the overall apparatus or configuration use, hence Morishige is directed to sufficiently analogous processing that one of ordinary skill in the art would have expected configurations used therein to be effective in Polanyi et al. to supply details of the means of gaseous monolayer deposition, as Polanyi et al. by not particularly detailing such configurations, clearly expects one of ordinary skill in the art to be able to supply affective means of gaseous delivery.

With respect to claim 9 the above arguments concerning use of standard gas delivery techniques should be noted, as well as figure 1 of Morishige, which illustrates such a conventional technique, of a configuration to applicant says is not present in a reference where it is explicitly shown. Again, gas delivered to the surface of a substrate, must clearly have been delivered "over" the substrate, and does not need to be explicitly mentioned for one to assume it has occurred, as it is unclear how else the gas would have arrived, if not "over". While neither reference explicitly discuss laminar flow, laminar flow is an old and well-known conventional technique and would've been obvious for reasons discussed above, but furthermore while Morishige does not discuss laminar flow the illustration of the gas supply and flow through the reaction cell of figure 1 is clearly suggestive of laminar flow. Also, as was stated in the initial rejection "use of conventional techniques depending on the precursor employed in its vaporization characteristics and transport properties" was considered obvious, and was considered inclusive of the

conventional technique of laminar flow. While appellants pointed out that laminar flow is not explicitly taught, they do not provide any reason why it supplies in an unobvious limitation to the claim.

With respect to claim 10, the comments concerning "over", etc., also apply, and furthermore as was previously pointed out by the examiner, Polanyi et al. explicitly teaches supplying gaseous precursors in order to form an ordered monolayer (summary in col. 3, lines 50-52). It would have been clear to one of ordinary skill if you have deposited such a monolayer film via exposure to gas, that your conditions were clearly sufficient to cause that formation, where the conditions are inclusive of all parameters that affect such formation, i.e. rate of supply, concentration, temperature, etc., as well as particular reagent, and one need not have an explicit recitation of an isolated parameter for such to be obvious.

With respect to claim 20, supplying reagents from a solid source material via vaporization or sublimation or the like, with use of a carrier gas is a very old and well-known CVD technique, hence in itself supplies no novel or critically different limitation to the process. As was stated in the initial rejection "use of conventional techniques depending on the precursor employed in its vaporization characteristics and transport properties" was considered obvious, and was considered inclusive of the conventional technique of having an initially solid reagents source supplied via carrier gas. The examiner finds nothing critical to the deposition process about this mode of supply precursors in the specification, and as Polanyi et al. suggest using gases known to those of skill in the art of chemical vapor deposition for supplying adsorbates, the rejection is considered to remain reasonable, especially considering appellants' arguments merely point out that the references do not particularly teach this old and well-known technique, providing no reason to consider it unobvious.

With respect to claims 23-25, which are considered further in view of Trushin et al., the examiner disagrees with appellants' conclusion (bottom of page 15 of the brief) the Polanyi et al. teach away from for femtosecond pulses, as an exemplary range (nanosec to picosec on col. 4), while not inclusive of femtosec (as acknowledged by the separate rejection), is also not exclusive. Also, the primary reference

uses other reactions besides complete dissociation and deposition in order to cause their patterning with radiation, such as the one where they mentioned that it is a femtoscale process, but that does not negate its significance to one of ordinary skill of the art in realizing that the reactions related to irradiation processes of Polanyi et al. may have femtosec time periods, especially given another col. 4 teaching concerning "... imprinting of...on a timescale which is predetermined by the irradiation time". Thus, knowing the femtosec reaction times via laser irradiation for decomposition of metal carbonyls as taught in the primary reference, is knowledge one of ordinary skill in the art would have been expected to be able to apply to the teachings of the Polanyi et al., especially given the taught relationship between processing timescale and irradiation time. Appellants' assertions on page 16 that the teachings of Trushin et al. are not consistent with the other references, are not understood, as it is unclear to the examiner how knowing the photo reaction time of metal carbonyls, and employing that knowledge in a process that uses metal carbonyls, can be inconsistent. As there is no intent or suggestion in the combination of Trushin et al.'s pulsed photo induced reactions & reaction-time, with Polanyi et al., and optionally Morishige to be using/adapting Trushin's experimental apparatus, hence appellants' comments concerning such, are irrelevant to the rejection.

As appellants have stated in section VI of their second amended appeal brief, that claim 7 is not being presented for further review in this appeal, hence as per MPEP 1205.02 (especially the paragraph bridging page 12-12 &-13), the rejection of this claim, which is just a narrower version of independent claim 1 directed to a specific organometallic gold compound (supplied by the tertiary reference(s)), and based on the same primary plus optional secondary references as applied to independent claim 1, is considered to be uncontested.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Marianne L. Padgett

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MLP/dictation software

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